METHOD AND SYSTEM FOR PROVIDING A COMMUNICATION PATH TO A MOBILE RADIO NETWORK AND TELECOMMUNICATIONS TERMINAL SUITABLE THEREFOR

The present invention relates to a method and a system for providing a communication path to a mobile telephony network, and also a telecommunication terminal suitable therefor; within the context of the present invention, the latter will generally be denoted as communication device or telecommunication terminal even if the device is possibly not usable for communication purposes exclusively.

In the known mobile telephony networks, when setting up a telecommunication connection, the terminals used for mobile telecommunication such as cellular phones or comparable devices with possibly expanded functionality are connected to the switching units, the so-called MSC (Mobile Switching Center - Mobile Switching Device), exclusively via radio systems of the corresponding mobile telephony network. The mobile telephony device is connected to the MSC via a radio channel by way of a radio base station (BSS - base station subsystem), the connection being routed as a function of the location of the mobile telecommunication terminal and the radio cell corresponding thereto, via a transmitter/receiver station (BTS - base transceiver station) and the control device (base station control) of the radio base station. One problem is that the number of free radio channels to a BSS, and thus to the individual MSC as well, is limited, so that bottlenecks may result with regard to the availability of telecommunication connections, at least in mobile telephony

networks of the current generation. To counter such problems, the connection charges are relatively high in some instances in an effort to keep the holding times of the channels within limits. Another problem of mobile telephony networks is that, due to areas without reception or due to shielding of the radio waves (in basements of some houses, for instance), the setup of a telecommunication connection via a mobile telephony device is sometimes impossible.

It is the object of the present invention to overcome the disadvantages of the related art. Specifically, a method is to be indicated that, for cost reasons or to overcome difficulties related to radio technology, for instance, allows a communication from or to a telecommunication terminal usable in a mobile telephony network via alternative communication paths. Furthermore, the object is to provide a system and a telecommunication terminal that may be used to implement the proposed method.

The object is achieved by a method for providing a communication path to a mobile telephony network having the features of the main claim. Advantageous developments and further refinements of the method according to the present invention are given by the dependent claims. A system and a telecommunication device for implementing the method are characterized by the device claims 10, 15 and 18 directed to such, and, in regard to possible further developments, by the dependent claims referring back thereto.

The method according to the present invention proceeds from the notion of bypassing the conventional communication paths of a mobile telephony network, which run via a radio base station, in the region between a telecommunication terminal suitable for operating in the mobile telephony network and the access and switching units of the mobile telephony network,

should such bypassing be necessary for reasons of availability or be desired by the user of the telecommunication terminal for other reasons and, furthermore, provided it is possible under the preconditions illustrated in the following. To set up a telecommunication connection between the telecommunication terminal to be used in the mobile telephony network and a distant terminal, the proposed method of the invention optionally utilizes as communication path between this telecommunication terminal and the access and switching units of the mobile telephony network a radio connection (radio propagation path) or a connection that includes the Internet (Internet communication path). This is done automatically or initiated by a user of the telecommunication terminal. The access and switching units and the telecommunication terminal treat the Internet communication path like another radio cell of the mobile radio communication network. This applies in particular to the sequences carried out when the telecommunication terminal inscribes or logs in to the mobile telephony communication network after connecting, and to the question of switching the communication path from the radio propagation path to the Internet path or vice versa in the course of a changeover (in an non-existing connection) or in a hand-over (in an existing connection). When detecting a possible Internet path, the user's telecommunication terminal thus initiates the inclusion of the Internet, either automatically or after obtaining the user's consent. If appropriate, the telecommunication terminal checks in at a virtual radio cell corresponding to the Internet communication path (such as a WLAN access point) in accordance with the rules of the local mobile telephony network (possibly including local authentication, DHCP, etc.). This is followed by a changeover, handover or, in a new start, for instance when the telecommunication terminal is turned on, an authentication in the mobile telephony system with a setup of

the Internet communication path for access to the mobile telephony network. Naturally, the implementation of the method is tied to the availability of an already briefly mentioned access point by which the telecommunication terminal suitable for operation in a mobile telephony network - preferably a cellular phone - is granted access to the Internet. According to a practical and preferred specific embodiment of the method, the connection of the telecommunication terminal to the Internet is set up with the aid of an Internet access unit to which the telecommunication terminal is networked in a LAN (Local Area Network) to this end. If a connection is set up that is dispatched from a cellular phone, one of the access and switching units of the mobile telephony network is addressed via the Internet communication path originating from the Internet access unit with the aid of an IP address assigned thereto. The communication is preferably set up via an IP-addressable mobile switching unit (MSC Mobile Switching Center or a comparable unit) of the mobile telephony network. If the telecommunication terminal (such as a cellular phone) detects several such access points, they may also be listed in a display of the device, if appropriate. However, an experimental processing of the access points or their processing by a search for particular parameters is conceivable as well.

According to a further development, the method allows an Internet communication path existing to an access and switching unit of the mobile telephony network to be rerouted thereby, possibly temporarily, to one that is in a geographically more advantageous location. To this end, the IP address stored in or during the configuration of the system, preferably in the telecommunication terminal, will be temporarily changed by the access and switching unit in question. According to another development, prior to setting

up a connection to one of the access and switching units of the mobile telephony network, a query is implemented to a server as a result of which the server transmits to the telecommunication terminal the IP address of an access and switching unit of the mobile telephony network to be addressed preferably. The request at the server naturally includes the transmission of information regarding the current radio area of the telecommunication terminal. According to an especially preferred specific embodiment of the present invention, the utilization of an Internet-routed connection to the units (such as the MSC) of the mobile telephony network is also billed at a more advantageous rate. This is realized in that the access and connection units of the mobile telephony network addressed via the Internet change the rate structure when setting up a corresponding connection, such change possibly being signaled to the user of the telecommunication terminal.

The inclusion of the telecommunication terminal in the LAN with the Internet access unit may be implemented in the conventional, wire-bound manner or via radio (wireless LAN - WLAN), or also optically, i.e., preferably via an infrared transmission path (IR - LAN).

In an advantageous further development, the method according to the present invention as it relates to the telecommunication terminal is designed to allow incoming and outgoing communications to be set under inclusion of the Internet communication path. For the incoming connections, the information Internet, i.e., preferably the Internet address (IP address) and possibly additional address information of the particular telecommunication terminal, are stored as location information (LA - Location Area) in a location register (VLR - Visited Location Register) of the access and

switching units of the mobile telephony network for this purpose. That is to say, it is the information Internet instead of the radio area of its current availability that is stored in the mobile telephony network for the particular subscriber number associated with the telecommunication terminal. As illustrated, the Internet address under which the device is now able to be reached is stored, so that in this case the Internet is basically treated like another radio cell. If the telecommunication terminal (such as the cellular phone) is not directly addressable (IP masquerading), the TCP/UDP port numbers via which the device is connected to the Internet are stored in addition. Here, the system, preferably the telecommunication terminal or cellular phone, cyclically sends out test data to safeguard the communication (refreshing of the respective entries in the translation table of the router). Changing port numbers are stored accordingly.

If, in an existing connection that includes the Internet, the quality parameters established for this communication are not attained or the connection is interrupted, an especially advantageous further development of the method according to the present invention provides that the connection be automatically switched to normal mobile telephony operation. This in done in that the connection is switched to a radio base station of the mobile telephony network and is routed to the MSC with the aid of a transmit/receive station of the BSS that is assigned to the radio cell corresponding to the location of the telecommunication device, and the associated central control device (BSC) of the BSS. The switching of the communication paths between a pure mobile telephony connection or a connection that includes the Internet is implemented by a switchover of the physical signal path, such switchover being regulated within the framework of a handover/changeover. The telecommunication terminal, preferably the cellular phone,

then reverts to default operation again, i.e., pure radio operation, until a usable Internet connection is detected again. The check of the quality values may be carried out by cyclically exchanged test texts, for instance. As already mentioned, a changeover may occur as well, that is to say, a passing-on in the case of a non-existing connection, so that the cellular phone may be transferred from a conventional radio cell to the "virtual" radio cell under inclusion of an Internet communication path even in those cases where no connection exists. If the method does not require the consent of the cellular phone user to this end, these procedures (with the exception of rate information, where applicable) take place as in a conventional mobile telephony operation, in the background and unnoticed by the user.

The system according to the present invention for implementing the introduced method includes a telecommunication terminal suitable for operation in a mobile telephony network, an Internet access unit able to be networked therewith in a LAN, as well as an access and switching unit (for instance, MSC) that is addressable via the Internet IP and integrated in the infrastructure of a mobile telephony network.

According to a possible development of the present invention, the terminal suitable for operation in a mobile telephony network is an appropriately designed TC-system, i.e., a TC system having a mobile telephony unit. The TC system advantageously includes a smart card reader for reading smart cards of a mobile telephony provider. According to an especially preferred specific embodiment, the TC system is also DSL-enabled, i.e., it utilizes a DSL connection to set up the connection to the access and switching devices of the mobile telephony network via the Internet. In this design of the system according to the present invention, it may even be possible for the user of the present invention to dispense

with a conventional analog or digital (ISDN) standard telephone line, thereby possibly saving the monthly charge for such a fixed subscriber line. Moves or changes in location cause no problems because of the user administration in the access and switching devices of the mobile telephony network.

In an especially advantageous further development of the invention, the system suitable for implementing the method also includes means by which, if appropriate, it is signaled to a user of the telecommunication terminal in a suitable manner that a less expensive connection than the radio communication path is available by using the Internet connecting path.

A telecommunication terminal suitable for implementing the method is designed as mobile telephone (cellular phone), which is equipped not only with the functional units (transmitter and receiver unit, etc.) for the operation in the mobile telephony network, but also with a control unit with a memory and means for integrating the device in a LAN. For one, the control unit is used to control the switch between the different operating modes that relate to the exclusively mobile-radio supported (mobile telephony operation) or an at least partially Internet-supported (Internet operation) telecommunication. On the other hand, in Internet operation, the control unit controls the LAN-based data exchange with the respective Internet access unit. Various means may alternatively or also simultaneously be provided in the device to integrate the telecommunication terminal into the LAN. In addition to the option of a normal, wire-bound connection to the LAN, for instance with the aid of suitable plugs, a unit for a radio-based connection to the LAN comes to mind here preferably. The LAN connection between the telecommunication terminal and the Internet access unit will then be configured as so-called wireless LAN (WLAN). Another possibility is to

optically couple the telecommunication terminal into the LAN. To this end, an IR transmitter and receiver unit are arranged in the device. Of course, the Internet access unit used for dialing into the Internet must also be provided with a corresponding IR unit for this type of coupling.

Another specific embodiment of a telecommunication terminal which allows utilization of the structures of a mobile telephony network at least under inclusion of the Internet is provided in the form of an appropriately equipped laptop. The laptop has a network card for the wire-bound or wireless connection to a LAN, and a chip card reader for reading chip cards of a mobile telephony provider. For voice communication, i.e., conducting a normal telephone call, the laptop equipped to implement the method also includes a soundcard and a headset.

In the following, the present invention will be explained in detail once again on the basis of an exemplary embodiment. To this end, Figure 1 shows the schematic configuration of the system according to the present invention together with a telecommunication terminal suitable for implementing the method.

Figure 1, by way of example, illustrates in a schematic representation both the basic structure of a system for implementing the method and also a telecommunication terminal included in this system. The illustration includes the units for setting up a normal mobile telephony communication, since the option of setting up such a mobile telephony communication is to be preserved according to the present invention and, as already illustrated, the alternative path via the Internet, which technically has equal access in this regard (at a more advantageous rate at most) quasi integrates itself into the structure of the existing mobile radio telephony network.

The system shown in the example essentially includes telecommunication terminal 1 suitable for use in a mobile telephony network, an Internet access unit 2 which is able to be networked with telecommunication terminal 1 in a LAN, and MSC 9 which is IP-addressable via the Internet and integrated in the infrastructure of the mobile telephony network. Internet access unit 2 is a WLAN access point, for instance, which is connected directly to a DSL router via a hub or a switch. If the access point operates openly (without password protection) and uses a DHCP function (a DHCP function can often be activated in a DSL router), various terminals have Internet access via this access point. For the purpose of setting up a radio communication 12, MSC 9 is assigned BTS 11 and BSC 10 of a conventional mobile telephony structure. Telecommunication device 1 shown is a mobile telephone (cellular phone), for instance, whose units 3, 7, 15 such as transmitter/receiver unit 7 provided for its normal use, have been supplemented by additional units 4, 5, 6. The control unit, i.e., controller 3, is a unit that is available in a regular cellular phone, but here is adapted to the expanded functionality of mobile telecommunication terminal 1. Units 4, 5, 6 mentioned last are units that make it possible to network telecommunication terminal 1 with Internet access unit 2 in a LAN in a variety of ways. While unit 4 allows a conventional LAN communication via cable, it is alternatively possible to set up a wireless LAN connection to Internet access unit 2 via units 5 and 6, provided, of course, Internet access unit 2 is equipped accordingly. For instance, using unit 6, a radio-based LAN connection (WLAN) and, via unit 5 having associated optical element 14, an IR-LAN connection to Internet access unit 2 may be set up provided it in turn is equipped with a wireless card or an IR transmitter/receiver unit. Using Internet access unit 2, telecommunication terminal 1 is able to set up an Internet connection 13 and, once the existence of

Internet connection 13 has been detected, a connection to IP-addressable MSC 9 via Internet 8. "Bottleneck" radio communication 12 via BTS 11 and BSC 10 to MSC 9 may thus be circumvented. The IP address of MSC 9 must be stored in telecommunication terminal 1 in advance during configuration of the system. It is also conceivable to temporarily modify the IP address afterwards with the aid of the switching system so as to reroute the connection to a switching system that is in a more convenient geographic location or has less traffic. After a connection has been set up and a stable Internet connection 13 is present, the same functions as in standard operation should run when a change occurs in the radio area (LA - Location Area). Technically speaking, Internet communication path 8, 13 is to appear as an additional radio area. In the VLR (Visited Location Register) of MSC 9, the IP address of telecommunication terminal 1 is registered as LA, so that, as far as telecommunication terminal 1 is concerned, outgoing and incoming communications are possible in the same way as in a normal mobile telephony network. However, the system may also include means that are not shown in the figure and which possibly signal to the user that a less expensive connection may be set up if Internet communication path 8, 13 is included. This is useful in particular if, according to an advantageous development of the system, a change in the rate structure is implemented by access and switching units 9, 10, 11, provided they are addressed via Internet 8. That is to say, the communication path to the mobile telephony network is set up automatically under inclusion of Internet 8, if appropriate. Where applicable, the user of a cellular phone utilized to set up the communication is made aware of this, however, in that the more advantageous rate is signaled, the user thus being able to adapt his talk behavior (call duration) to this type of connection set-up. Instead of a cellular phone, telecommunication terminal 1 may also be a

laptop with a network card, a sound card and a headset. However, if the laptop itself does not include a mobile telephony unit, it behaves like a cellular phone from which the call connections are always set up under inclusion of Internet connection 8, 13.

List of Reference Symbols

1 Telecommunication terminal

2 Internet access unit

3 Control unit or controller with memories

4 Unit for wire-bound LAN communication

5 Unit for IR-LAN communication

6 Unit for WLAN connection

7 Transmitter/Receiver unit for mobile telephony connection

8 Internet

9 MSC

10 BSC

11 BTS

12 Radio connection

13 Connection

14 Optical element for IR connection

15 Other cellular phone technology